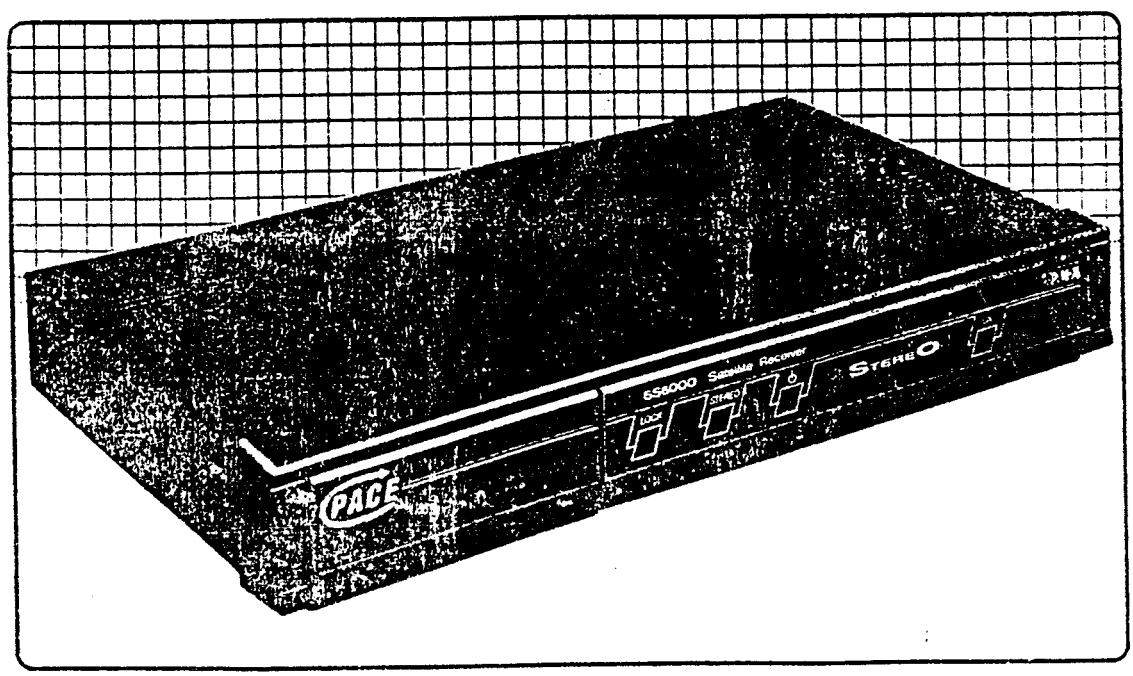
PACE

Micro Technology Ltd

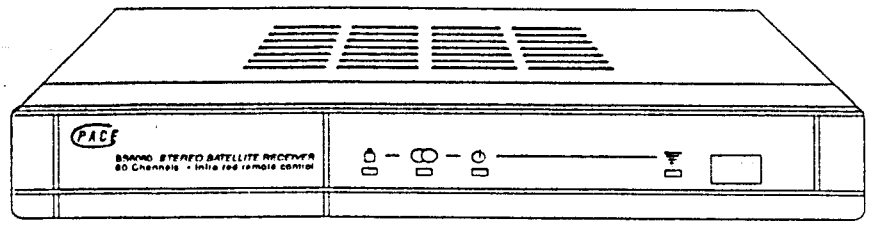
STEREO SATELLITE T.V. RECEIVER

SERVICE MANUAL



PACE

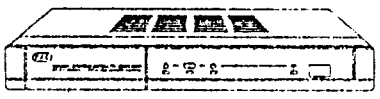
SS6060 SERIES SATELLITE RECEIVERS



PACE

OPERATING INSTRUCTIONS

INTRODUCTION



The Pace SS6060 Series Satellite Receivers are quality products designed and built in the UK to provide years of trouble free service.

It is important that you read this manual completely to obtain the best results from your receiver.

Pace recommend that installation be carried out by a qualified satellite TV installation engineer.

This stereo receiver is fitted with the PANDA* noise reduction system to enhance its performance.

* PANDA is a trademark of Wegener Communications Inc.

SAFE USE OF EQUIPMENT

This equipment has been designed and manufactured to meet international safety standards but, like any electrical equipment, care must be taken if you are to obtain the best results and safety is to be assured.

Do ensure that all electrical connections are properly made and are in accordance with the manufacturers instructions.

Do not obstruct the ventilation slots of the receiver. Never stand it on soft furnishings such as carpets.

Do not use or store the receiver in excessively hot, cold, damp or dusty conditions.

Never allow anyone especially children to push anything into holes or slots or any other opening in the case - this could result in a fatal electric shock.

Always put the receiver into standby mode when not in use.

If you have any doubt about the installation, operation or safety of the receiver, consult your dealer.

INSTALLING THE SYSTEM

Adding New Programmes

To add new programmes it will be necessary to first locate them. This can most easily be done using the frequency scan mode which is enabled by pressing the SETUP key followed by the 3, 6, 9 keys. The record lock LED will flash as the receiver scans for programmes on the polarity you were last viewing. When a picture is seen, press the SETUP key to halt the scan. The picture will have the Installation menu super-imposed on it. Continue as described in the Modifying Existing Programmes section to fine tune this new programme. To quickly end a scan, press the NORM key. To scan for programmes on the opposite polarity, it is necessary to select a suitable programme on the opposite polarity and enter SETUP, 3, 6, 9 again.

Fitting of External Decoders

The receiver has the capability of accepting an external decoder via the DECODER SCART socket on the rear panel of the receiver. If an external decoder correctly controls pin 8 of the DECODER SCART socket, the receiver will switch automatically to this input otherwise it will be necessary to set the AV source setting to EXT V.

Record Lock Mode

To put the unit in record lock mode press the SETUP key followed by the 9, 8, 7 keys. This will prevent any changes being made until this mode is cancelled. It is intended to be used when a video recording is being made to prevent accidental programme change. To cancel the mode simply press the SETUP, 9, 8, 7 keys again.

NOTE: When in this mode, the record lock LED will be illuminated and the sound, if muted, will return. If the audio mode has been changed, the default setting will be returned.

CONNECTION TO THE MAINS SUPPLY

POWER SUPPLY

IMPORTANT: Before plugging in and switching on your unit, check that the voltage rating for your country, stated below, matches that on the rear panel of the unit. If this is not the case, DO NOT use this unit until you have contacted your dealer who will be able to advise you.

FOR UK & NORTHERN IRELAND USE ONLY

Connect to 240V 50Hz AC mains supplies only
Do not connect to DC mains

FOR EUROPEAN & EIRE USE ONLY

Connect to 220V 50Hz AC mains supplies only
Do not connect to DC mains

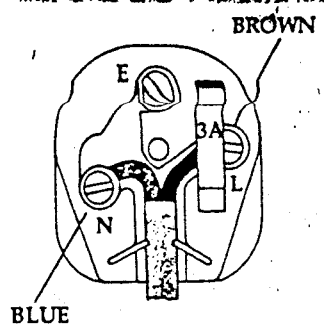
TO AVOID THE RISK OF ELECTRIC SHOCK DO NOT REMOVE THE COVER OF THIS EQUIPMENT WITHOUT DISCONNECTING IT FROM THE MAINS SUPPLY.

Mains lead plug connections (UK, Northern Ireland & Eire)

IMPORTANT: The wires in the mains lead are coloured in accordance with the following code.

Blue	:	Neutral
Brown	:	Live

As the colours of the wires in the mains lead of the apparatus may not correspond with the colour markings identifying the terminals in your plug, proceed as follows:



The BLUE wire must be connected to the terminal marked with the letter N or coloured black.

The BROWN wire must be connected to the terminal marked with the letter L or coloured red.

Do not connect either the BLUE or BROWN wire to the terminal which is marked by the letter E or by the safety earth symbol ⏚ or coloured GREEN or GREEN AND YELLOW.

A fused plug must be fitted with a 3 Amp fuse. When using a non fused plug, an external mains fuse must not exceed 5 Amp.

If in doubt consult a competent electrician.

For European Countries

The mains lead is supplied terminated with a 2-pin moulded plug.

USING PROGRAMMES

The default option for all programmes is AUTO so that if a decoder is used which controls pin 8 of the DECODER SCART socket the video loop-through feature would be automatically enabled. A decoder which does not control pin 8 requires the EXT V option to force loop-through to take place.

NOTE: If you select EXT V or EXT AV without a decoder fitted, the picture will disappear.

5) AUDIO

As we have already seen, the audio mode can be changed for each programme using the AUDIO key. When in the Installation menu, the ▲ or ▼ keys can also be used to perform the same function. Listed below are the preset audio frequencies:

STEREO A	7.02 & 7.20 MHz
STEREO B	7.38 & 7.56 MHz
STEREO C	7.74 & 7.92 MHz
STEREO D	8.10 & 8.28 MHz
MONO 1	6.50 MHz (Non-PANDA)
MONO 2	7.02 MHz
MONO 3	7.20 MHz
MONO 4	7.38 MHz
MONO 5	7.56 MHz
MONO 6	7.74 MHz
MONO 7	7.92 MHz
MONO 8	8.10 MHz
MONO 9	8.28 MHz

NOTE: The stereo LED will come on when stereo mode is selected. This does not necessarily indicate that the transmission is in stereo.

6) FREQ

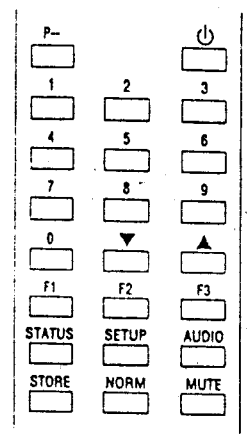
This option allows you to vary the audio frequency for both mono and stereo modes, to tune into programmes using audio frequencies different to the preset ones. If the preset frequency is changed, this will be indicated by the audio mode changing from say MONO 3 to MONO V to show that it has been altered from its original setting and a variable mode has been selected.

NOTE: At the bottom of the screen is the PANDA noise reduction indicator. This will be on unless Mono 1 is selected.

When all settings are as required, press the STORE key once. This will bring the WHICH PROGRAMME prompt on screen. Select the programme number you wish to store this information against using the ▲ or ▼ keys or directly enter the programme number and press the STORE key again. This will store all the settings for the programme and put the receiver back into normal mode.

REMOTE CONTROL HANDSET

HANDSET LAYOUT



BATTERY INSTALLATION

When using the handset be sure to point it towards the receiver front panel where the infra-red receive window is located. The handset operates on two AA batteries or equivalent which are to be found behind the sliding cover on the underside of the handset. At some time, the batteries will need replacing. Do this as soon as the handset fails to operate from normal viewing distance.

NOTE: Never leave flat batteries in the handset as they may leak and corrode the metal contacts.

The SETUP, NORM and STORE keys are primarily used when setting up the receiver using the on-screen graphics menus and should normally only be used by the installer.

The F1, F2 and F3 keys are not used by this receiver.

The following information assumes that your dish aerial and receiver have been correctly installed. If this is not the case, refer to the Installation Guide in this manual.

Operation is carried out by use of the remote control handset. When selecting the on-screen graphics menus, it will be necessary to use several keys which must be pressed within a timeout period (usually 2 seconds between each key press). This is also true for other multi-key functions.

and/or VCR to the mains supply and switch on. Select the programme on your TV set that has been allocated to the receiver. When the mains supply is first connected, the receiver will be in its standby state. To bring the receiver out of standby, simply press the ⏻ key or a programme number using the handset.

Selecting Programmes

Programmes are selected by pressing the numeric keys 1-9. To select programmes above 9, press the P– key followed by the required programme number. For example, to select programme 10, press the P– key followed by the 1 and 0 keys. It is also possible to browse through all the programmes using the ▲ or ▼ keys. The programme ident will be displayed briefly in the top right-hand corner of the TV screen.

Permanent Programme Ident Display

It is possible to permanently display the programme ident on your TV screen rather than for just a few seconds as is normal when switching between programmes. This feature is selected by pressing the SETUP key followed by the 0 key. Repeat SETUP, 0 to remove the feature.

Programme Status

Pressing the STATUS key will display the programme ident, audio mode and audio frequency of the programme you are viewing. This display will disappear after approximately 3 seconds.

Audio Mode

The AUDIO key is used to cycle through all the audio modes. On certain programmes it is possible to receive multi-language, stereo or radio transmissions, e.g. Sky One also transmits Sky Radio in addition to the Sky One soundtrack. To hear these alternative transmissions, simply press the AUDIO key to select the desired mode.

Standby

To 'power down' the receiver, press the ⏻ key. The receiver will stay in standby mode as long as the mains supply is connected.

IMPORTANT NOTE: Your receiver may have been installed by looping the TV aerial through the receiver. If this is the case, it is important to appreciate that the receiver must always be connected to the mains supply when terrestrial TV programmes are to be viewed.

a suitable decoder unit. Contact your dealer for further details.

On-screen Graphics Menus

Certain functions of the receiver are performed by use of on-screen graphics menus e.g. modifying or adding new programmes. Menus are only viewable when a picture is present. Once in a menu, the SETUP and STATUS keys are used to move forward and backward through the parameters and the ▲ and ▼ keys are used to alter parameters. Direct entry using the numeric keys is often permissible and shall be highlighted as we go through the functions. If you want to undo alterations in a menu, simply press the NORM key and this will remove the menu from your screen and erase any changes.

CUSTOMISE PROGRAMMES

The receiver is capable of storing 60 programmes and comes to you pre-tuned to the 32 Astra programmes. However, if you wish to modify or add new programmes the following section explains the procedures.

Modifying Existing Programmes

Select the programme you wish to modify and bring the Installation menu onto your screen. This is done by pressing the SETUP key followed by the 1, 4, 7 keys. When on screen, the record lock LED will be flashing.

If, when using the on-screen graphics menus, you wish to undo alterations, simply press the NORM key. This will remove the menu from your screen and erase any changes. Once in a menu, the SETUP and STATUS keys are used to move forward and backward through the parameters and the ▲ and ▼ keys are used to alter parameters.

NOTE: Menus are only viewable when a picture is present.

There are eight alterable options spread over two pages in this menu as follows:-

1) FREQUENCY

The vision frequency can be adjusted and it is possible to directly enter the frequency using the numeric keys. For example, for a programme on the frequency of 11.214GHz, simply press the 1, 1, 2, 1, 4 keys.

2) POLARITY

Satellite TV programmes are transmitted either vertically or horizontally. The correct polarity must be assigned to each programme.

3) BASEBAND

The baseband output is used to feed an external decoder. This signal falls into two main categories, PAL or MAC. All the preset programmes of this receiver are set to PAL. In the future some programmes may choose the MAC system. This option allows you to switch the baseband output, provided by the DECODER SCART, to be either filtered for a PAL decoder or flat for a MAC decoder.

4) AV SOURCE

The Audio and Video source can be selected from four options:

INT - internal audio and video. In this mode no external audio or video loop-through takes place, therefore ignoring any external decoder.

AUTO - automatic audio and video loop-through controlled by pin 8 of the DECODER SCART.

EXT V - external video loop-through only. Internal audio fed to TV/VCR SCART.

EXT AV - external audio and video loop-through from the DECODER SCART to the TV/VCR SCART.

INSTALLATION GUIDE (for the Installation Engineer)

Connecting Stereo Equipment

To obtain the maximum performance from your satellite viewing, it is recommended that the receiver is connected to either a stereo amplifier, hi-fi stack system or a stereo TV.

Connect phono leads from the AUDIO OUT sockets on the receiver to an amplifier which is switched to Auxiliary Input. Speakers should be positioned either side of the TV.

If a stereo TV is used, you must use a SCART lead to connect the TV and receiver to hear true stereo.

See previous page for connection diagrams.

Tuning In the TV/VCR to the Satellite Receiver

Having connected the receiver to the dish aerial, TV and/or VCR, switch on all the equipment. Select a programme on your TV/VCR you want to allocate to satellite programmes and bring the receiver out of standby. If a picture is not visible, move the TEST/NORM switch on the rear panel to TEST. If two vertical bars (the test signal) are not visible then adjust either the TV/VCR to channel 38 or the channel adjustment screw CH on the receiver rear panel to the same frequency as the TV/VCR. Once the two vertical bars are visible move the TEST/NORM switch to NORM. If installation is correct a satellite picture should be visible. It may be necessary to fine tune the TV for the sharpest possible picture.

VCR record using SCART

When using a SCART lead to connect a VCR, the following must be noted. To record from the satellite receiver to a VCR it will be necessary to select AUX or AV on the VCR as the programme to record.

LNB IF Offset Menu

If the picture is speckly, it may be necessary to adjust the LNB IF offset to correct for variations in the LNB output frequency.

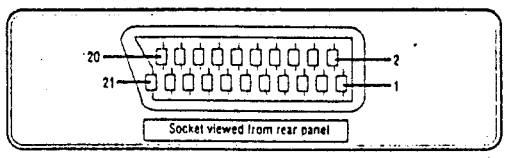
A few minutes must be allowed for the LNB to reach its operating temperature before making any adjustments. Check that the frequency for the chosen programme is correct by entering the Installation menu (see Modifying Existing Channels section) e.g. programme 7 (MTV) is 11.421GHz.

Pressing the SETUP key followed by the 2, 5, 8 keys will bring the LNB IF offset menu on screen. The record lock LED will be flashing. Use the ▲ or ▼ keys to adjust the LNB offset to get a picture as free from sparkles as possible. To optimise the picture, it is possible to change programmes whilst in this menu by directly entering the programme number using the P– and/or the numeric keys.

Contrast

The second option in this menu is the contrast setting which may be set to low, medium or high.

Pressing the STORE key will retain any adjustments made in the LNB IF offset menu. This is normally all that will be required when installing and setting up the receiver.



DECODER SCART		TV/VCR SCART
1.	Audio out RH	Audio out RH
2.	Audio in RH	
3.	Audio out LH	Audio out LH
4.	Audio earth	Audio earth
5.	Blue earth	Blue earth
6.	Audio in LH	
7.	Blue in	Blue out
8.	Decoder status	
9.	Green earth	Green earth
11.	Green in	Green out
13.	Red earth	Red earth
15.	Red in	Red out
16.	RGB status	RGB status
17.	Video earth	Video earth
18.	RGB status earth	
19.	Video out - baseband	Video out
20.	Video in	
21.	Casing socket earth	Casing socket earth

All other pins are not implemented.

NOTE: The RGB pins on the DECODER and TV/VCR SCART sockets are simply linked together to allow the future use of a MAC decoder.

Prog. No.	Service	Frequency	Transponder	Polarity
1	SKY CHANNEL	11.318GHz	8	V1
2	SKY NEWS	11.376GHz	12	V1
3	SKY MOVIES	11.435GHz	16	V1
4	EUROSPORT	11.258GHz	4	V1
5	TELECLUB	11.332GHz	9	H1
6	RTL-V	11.391GHz	13	H1
7	MTV	11.421GHz	15	H2
8	SCREENSPORT	11.214GHz	1	H1
9	LIFESTYLE/The Childrens Channel	11.273GHz	5	H1
10	FILMNET	11.362GHz	11	H2
11	SCAN SAT	11.303GHz	7	H2
12	SCAN SAT TV3	11.244GHz	3	H2
13	RTL	11.229GHz	2	V2
14	SAT 1	11.288GHz	6	V2
15	3 SAT	11.347GHz	10	V2
16	PRO 7	11.406GHz	14	V2
17	Presently Unallocated	11.508GHz	20	V
18	Presently Unallocated	11.567GHz	24	V
19	Presently Unallocated	11.626GHz	28	V
20	Presently Unallocated	11.685GHz	32	V
21	Presently Unallocated	11.464GHz	17	H
22	Presently Unallocated	11.523GHz	21	H
23	Presently Unallocated	11.582GHz	25	H
24	Presently Unallocated	11.641GHz	29	H
25	Presently Unallocated	11.494GHz	19	H
26	Presently Unallocated	11.553GHz	23	H
27	Presently Unallocated	11.612GHz	27	H
28	Presently Unallocated	11.671GHz	31	H
29	Presently Unallocated	11.479GHz	18	V
30	Presently Unallocated	11.538GHz	22	V
31	Presently Unallocated	11.597GHz	26	V
32	Presently Unallocated	11.656GHz	30	V

Number of Programmes	60
Receiving Frequency	950-1750MHz
LNB Output Voltage	Horiz. 17.2v, Vert. 12.6v
Input Impedance	75 Ohms
I.F. Frequency	479.5MHz
I.F. Bandwidth	27MHz
Input Level	-63 to -25 dBm
Image Rejection	50dB (typically)
Input Connector	Type F Female
Threshold	6.5dB C/N (typically)
Video De-emphasis	CCIR 405-1
Video Output level	1v p-p
Video Output Impedance	75 Ohms
Video Frequency Response	50Hz to 4.8MHz +/-3dB
Video Output Connector	SCART
Baseband Output Level	1v p-p
Baseband Modes (MAC/PAL)	Flat or Filtered (Software Switched)
Baseband Frequency Response (MAC)	DC to 10.5MHz
Energy Dispersion Removal	Greater than 40dB
Audio Modes	Main Mono (Tunable) Stereo Pairs (Tunable) Individual channels (Tunable)
Main Mono Subcarrier	5.0 to 10.0MHz tunable
Stereo Subcarriers	7.02 & 7.20MHz PANDA 1 7.38 & 7.56MHz PANDA 1 7.74 & 7.92MHz PANDA 1 8.10 & 8.28MHz PANDA 1 All tunable (runs 5.0 to 10.0 MHz
Audio Frequency Response	50Hz to 16KHz +/-3dB
Audio Output Level	0dBm/600 Ohms
Audio Bandwidth	150KHz
Audio Output Connector	SCART and PHONO'S
U.H.F. Modulator	CCIR CH 30 to 39 with test signal. Preset to channel 38
Operating voltage	240v +/- 10%- 50Hz (U.K. & N.Ireland) 220v +/- 10%- 50Hz (Europe & Eire)
Power Consumption	30 Watts (typically)
Dimensions	H 56mm, W 360mm, D 200mm
Weight	3.4Kg

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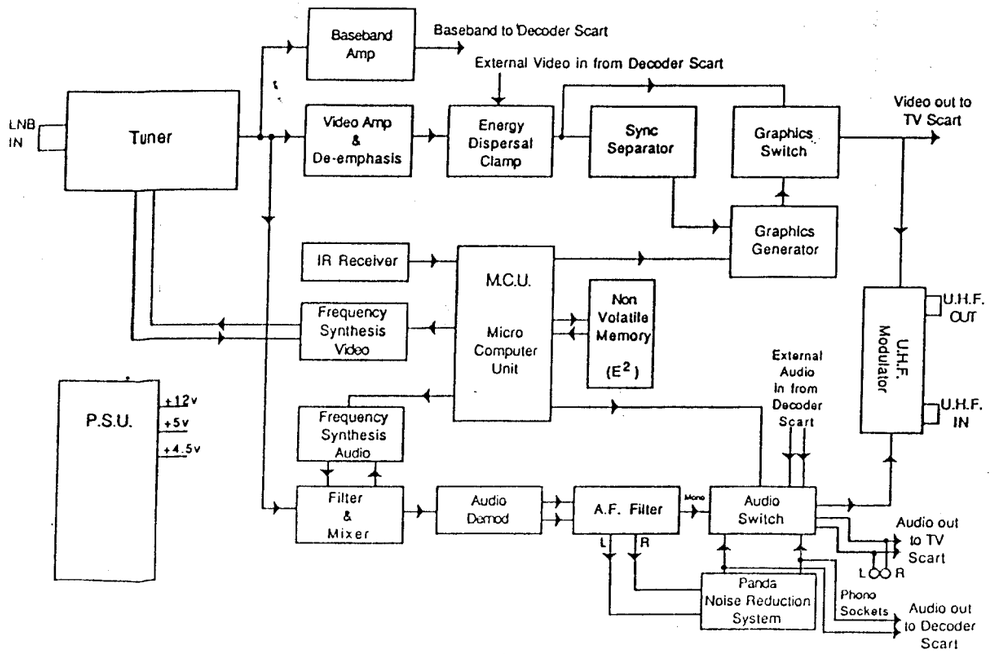
BLOCK DIAGRAM



1 GENERAL PRECAUTIONS

REMEMBER: SAFETY FIRST

1.1 Always disconnect the unit from the mains supply before removing or re-installing any component, circuit board, module or any part of the assembly.

1.2 Before switching the unit on always confirm that the voltage rating on back of the unit matches the voltage for your country.

1.3 Do not spray any chemicals on or near the unit.

1.4 Faulty components must be replaced with the correct value and rated component by a competent engineer. Failure to do so could invalidate safety approvals.

CAUTION: Wrong substitution of electrolytic capacitors may result in an explosion hazard.

Fig 1

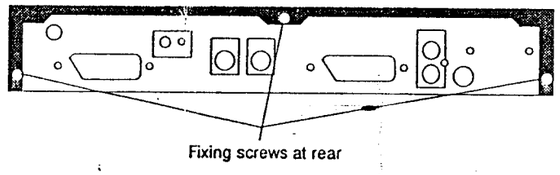


Fig 2

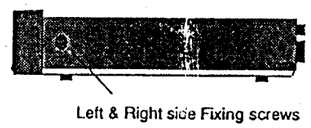
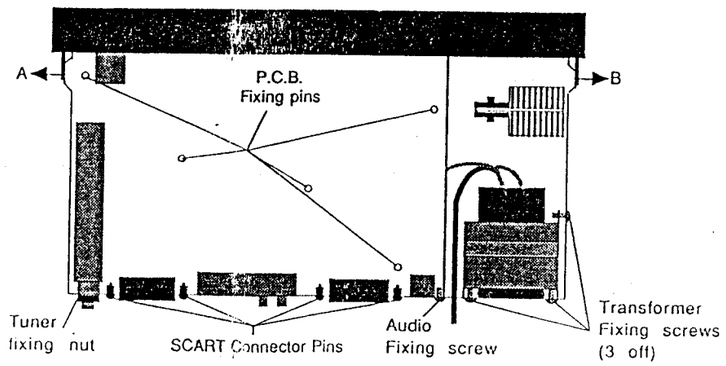


Fig 3



2 - ELECTROSTATIC SENSITIVE DEVICES

All semi-conductors are Electrostatic Sensitive Devices (ESD) and can be damaged by static charges and static fields. When handling Electrostatic Sensitive Devices it is important that the following precautions should be observed.

2.1 Handle all static sensitive devices at an E.S.D. protected work station. This is a work station equipped with a conductive bench mat connected to earth via a two Meg Ohm resistance, a wrist band connected to a wrist strap which is connected to the bench mat and a grounded floor mat.

2.2 Keep all static sensitive devices in static protected bags, or containers, until they are required and only remove them from the bag or container whilst at a static protected work station.

2.3 After removing assemblies with E.S.D.'s fitted, place the assembly into a static protected bag or container.

2.4 Only use soldering irons with a grounded tip.

2.5 Only use anti-static solder removal devices.

3 ACCESS FOR SERVICE

(Always disconnect the unit from mains before dismantling.)

Case Removal

1) Locate and remove the 3 Fixing screws on rear panel (*Fig 1*)

2) Locate and remove both the left and right hand side screws (*Fig 2*)

3) Turn the receiver round, so that the rear panel is facing you.

4) Hold both sides of the black case and slide it towards you, over the rear panel of the unit.

Front Panel Removal

1) Once the case is removed from the unit the front panel will ease off from the front, when points A & B are prised gently outwards (*Fig 3*).

Main P.C.B. Removal

1) Locate Scart Connectors and push the four pins (holding in the Scart Connectors, see *Fig 3*) from inside the receiver. Push just enough to allow the center of the pin to disappear.

2) Pull the pins from the back panel and they will come out.

3) Locate the Audio Fixing screw and remove.

4) Disconnect the Transformer Secondary Cable Assembly from the P.C.B., and the Transistor Cable from the transistor.

5) Locate and remove the Tuner fixing nut.

6) Locate and remove the 5 fixing pins on the P.C.B. (Fig 3)

7) The P.C.B. will now be free to remove.

TUNER

The tuner consists of two units, a tuner unit and a de-modulator, soldered together. The combined unit will be referred to as 'The Tuner' (Module 1).

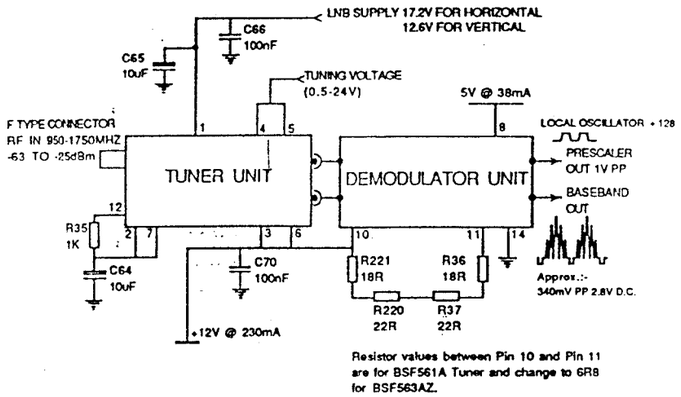


Fig. 4

The function of this module is to take in the wide-band IF from the LNB in the band 950-1750MHz and convert it to a second IF of 479.5MHz which is then amplified and demodulated. The demodulated output which consists of Video Baseband Signal is fed via a flying lead to PLA on the PCB.

A frequency synthesis method of tuning is used in this receiver. This function is performed by U20 and operates in the following manner.

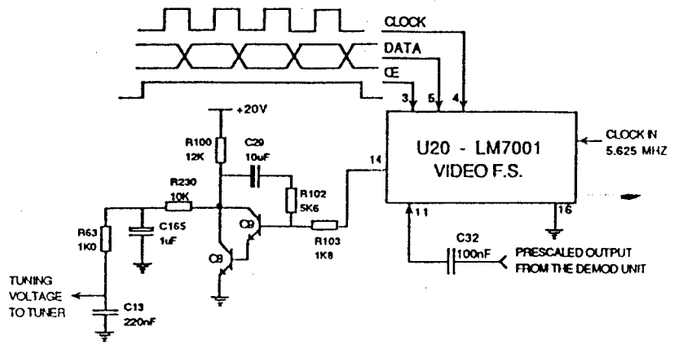


Fig. 5

A frequency corresponding to 128th of the tuner local oscillator frequency is provided via the upper flying lead from the tuner module to PLB on the PCB. This is called the prescaler output and is fed to Pin 11 of U20 via C32. When a channel is selected using the handset, a 10 bit word corresponding to the frequency specified in the frequency option of the installation menu is loaded into Frequency Synthesis Chip, U20, and is used to divide the 5.625MHz reference clock.

The F.S. Chip U20 uses a phase comparator to compare the prescaled output of the tuner with the divided reference clock. Depending on the phase difference between the two, error pulses are generated on the output Pin 14. The error pulses may be positive or negative going, depending on whether the phase of prescaled output was leading or lagging with respect to the reference clock.

The error pulses are integrated by using the RC Network of C29 and R102. Q8 and Q9 are configured as a darlington pair and switched on or off, by the error pulses, to discharge or charge C29 respectively. The integrated signal is then transferred to C13 via current limiting resistors R230 and R63.

The D.C. level on C13 is used to drive the V.C.O. in the tuner, thus increasing or decreasing the local oscillator frequency until in tune with the reference clock and any deviation is corrected by varying this tuning voltage.

The signal from here is A.C. coupled by C44 to the video amplifier U21 (UA733), which has its differential inputs biased at mid rail 6V D.C., since it is fed from single supply.

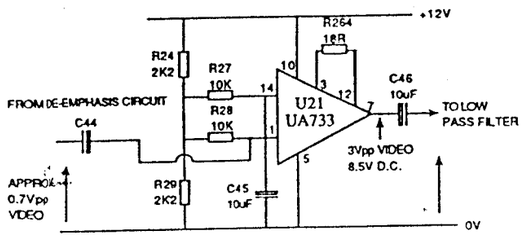


Fig. 8

C45 serves as a de-coupling capacitor and the gain of the video amp is set by R264.

The output of the video amp U21 Pin 7 is fed to a 5MHz low pass filter (not shown) formed by L1, L2 etc. via Q10, which is configured as an emitter follower circuit for impedance matching.

6.2 Video Amp and De-emphasis

Baseband video output from the tuner is also fed to U21, the video amplifier via a de-emphasis network, as shown in Fig. 7.

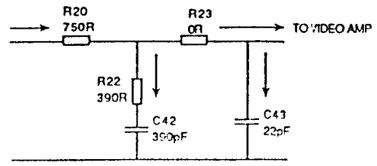


Fig. 7

This is achieved by U4 Pin 10 control signal switching Q39 and Q38 on for PAL and off for MAC. When PAL is selected Q39 is switched on, enabling de-emphasis filter formed by R41, C53 and C54 to conduct. Q38 is also switched on to insert R214 in parallel with R46 to increase the gain of common emitter amplifier formed by Q36.

Q37 forms a further amplification stage with Q16 configured as an emitter follower to give an output impedance of approximately 75 Ohms.

The high frequency break point for the de-emphasis network is set by R22 and C42 at approximately 1MHz. R20 and R22 form a potential divider to set the attenuation level. C43 filters very high frequency noise which may be present at this stage.

6 VIDEO SECTION

6.1 Baseband Amplifier

The Baseband signal from the Tuner Module on PLA is split into three paths, one to the baseband amplifier, one to the audio section and the last to the video amplifier.

The amplified baseband signal is provided to Pin 19 of the decoder scart socket and may be selected for either MAC or PAL.

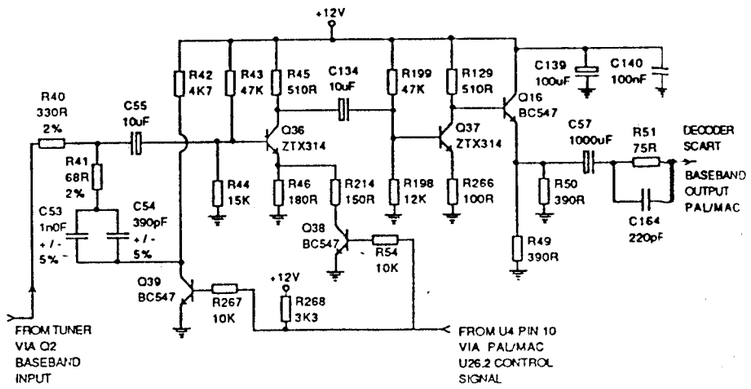


Fig. 6

The operation of baseband circuit varies depending whether the channel selected has the decoder option in the installation menu set to PAL or MAC.

If the option is set to MAC then the full bandwidth from the output of the tuner/demodulator is maintained throughout the baseband circuit. However, if this option is set to PAL, then PAL de-emphasis (CCIR 405) will take place.

The video signal from here is fed to U7 (4053) as shown in Fig. 9.

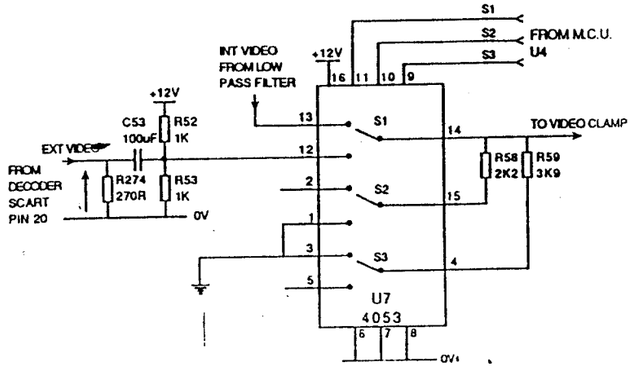


Fig. 9

U7 is controlled by the M.C.U. (Pins 14, 19, 20) to switch in different resistor values to give the chosen contrast levels, similarly externally fed video may also be selected at this stage.

6.3 Energy Dispersal Clamp

The power spectrum density of unmodified Satellite transmission is not evenly distributed but is concentrated in peaks. Due to this peaking effect interference to other channels is possible, therefore a special low frequency energy dispersal signal of 25Hz triangular wave is added to all transmission to effectively flatten the peaks, spreading the energy more evenly over the spectrum hence reducing the risk of interference.

On reception the energy dispersal signal needs to be removed and is achieved by means of a clamping circuit formed by Q13 and Q14 as shown in Fig. 10.

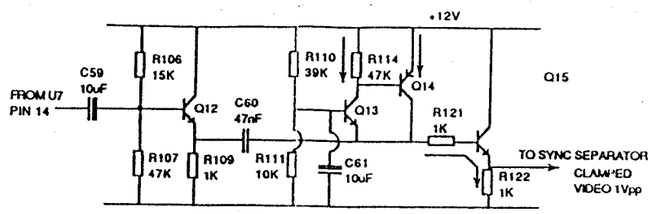


Fig. 10

The clamping level on the emitter of Q13 is approximately 1.7V set by the potential divider formed by R110 and R111 minus the base-emitter drop of Q13.

The video superimposed on the energy dispersal signal is buffered by Q12 to C60. The time constant of C60+ (R121 and base-emitter Junction) is chosen such that C60 discharges virtually at the same rate as the charging of positive going slope of energy dispersal signal, therefore Q13 remains switched off with its emitter at slightly above 1.7V.

On the falling slope of energy dispersal signal the emitter of Q13 tries to drop below 1.7V, but as this happens Q13 switches on to provide the extra current to charge C60, therefore maintaining a constant clamping level (1.7V) at the emitter of Q13. Due to the fact that C60 is charged and discharged to maintain a constant level at the emitter of Q13 the energy dispersal signal is removed.

However, the fast falling edge of sync pulses is sufficient to pull emitter below 1.7V, this is also compensated by increased current from Q13 and Q14, therefore, clamping the bottom of the sync pulses.

The video signal is not effected because the tilt (discharge rate of C60) for the active period of a line (52µs) is minimal.

6.4 Sync Separator

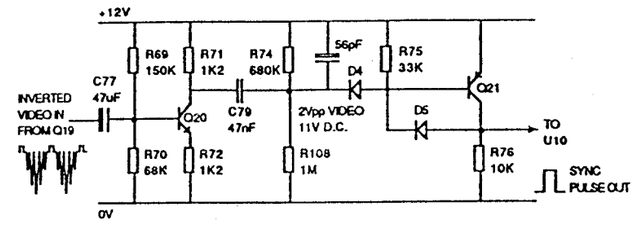


Fig. 11

The video signal is amplified and inverted by a common emitter stage formed by Q19 (not shown above) and fed to the base of Q20, coupled via C77. Since the signal at this point is inverted the collector of Q20 is at its lowest level on the sync tips.

As the collector voltage drops, C79 starts to charge via D4. Due to the current flow through R75 and D4, the base of Q21 falls negative with respect to 12V supply line switching Q21 on, also because of the current conduction through Q21, voltage is developed across R76.

As soon as C79 charges, Q21 switches off since D4 is no longer forward biased. Therefore, the emitter of Q21 falls to zero.

D5 stops Q21 from saturating (i.e. reduces storage effect).

6.7 Graphics Generator

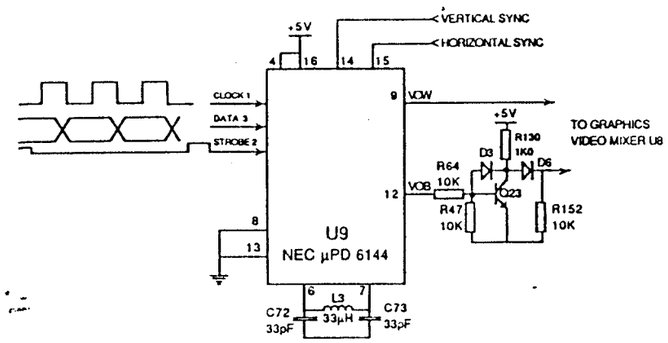


Fig. 14

The graphics generator (U9) has an on chip oscillator, the frequency of which is set by L/C network between Pins 6 and 7 and is set at approximately 6MHz.

The M.C.U. communicates with the graphics generator U9 by means of a serial data line, clock line and control line. The graphics generator produces two control lines VOB and VOW.

The VOB is inverted by Q23 and fed to U8 together with VOW. D3 speeds the switching time since it draws current from the base when the collector is near saturation (i.e. reduces storage effect.)

6.6 Vertical Sync

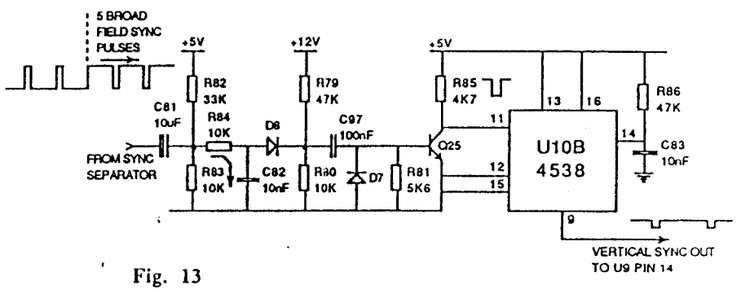


Fig. 13

Frame sync pulses are obtained by using a field integrator circuit formed by R84 and C82. The field sync pulses charge C82 until it reaches above approximately 2.8V, at which point D8 turns on and the charge is transferred to C97, which will switch Q25 on hence the collector of Q25 drops to zero momentarily. This negative pulse is used to trigger U10B monostable, which has its output pulse width set by R86 and C83. The output on Pin 9 of U10B forms the vertical sync and is fed to the graphics chip U9, Pin 14.

6.5 Horizontal Sync

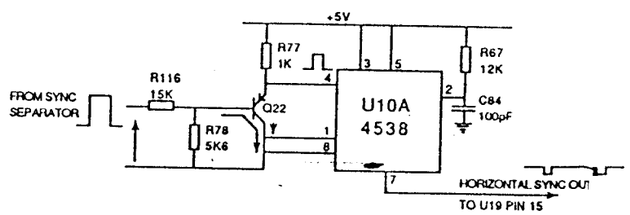


Fig. 12

The positive going pulses at the base of Q22 switch off Q22, hence giving 5V positive pulse at emitter of Q22, which is used to trigger a monostable U10A.

The monostable is configured to trigger on rising edge of the input and the output pulse width is determined by the RC time constant of R67 and C84.

The inverted output on Pin 7 U10A is taken to feed the horizontal sync to the graphics chip U9 Pin 15.

6.8 Graphics Switch

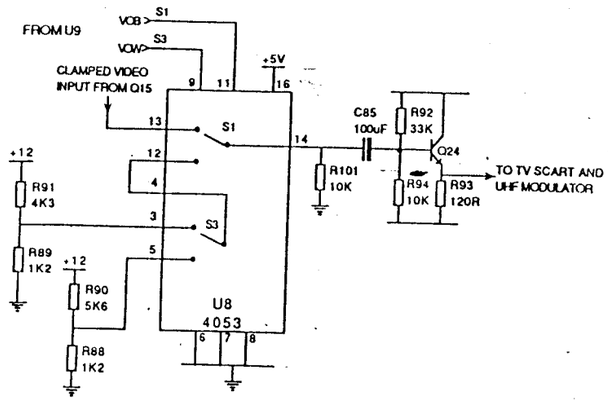


Fig. 15

The output of U9 operates the analogue gates within U8. VOB controls S1 which switches between video or on-screen graphics information. VOW controls S3 which selects the black or white level as set up by the two potential dividers formed by R90/R88 and R91 and R89.

The video combined with the graphics is then buffered by an emitter follower formed by Q24 and is fed to the TV Scart Socket and the UHF modulator.

7.5 Audio Switch

The audio source and mode are selected by analogue switches within U16 and U2 as shown below:-

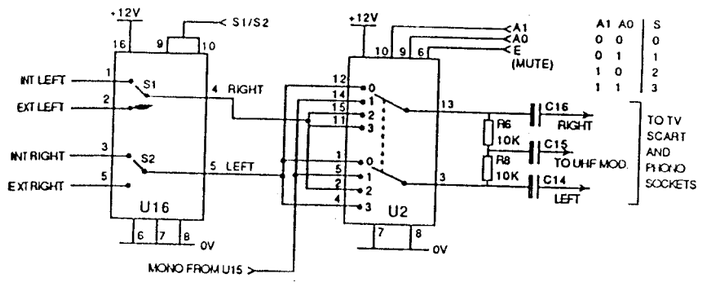


Fig. 20

U16 is controlled by the M.C.U. via an Inverting Level Converter, U5A and configured as a double pole double throw switch to route internal or externally fed (from Decoder scart socket) audio channels to the audio mode select IC U2.

U2 is a two channel four way switch controlled by two address lines and an enable line. The control signals come from the M.C.U. via Inverting Level Converter, U26 (5V signals changed to 12V signals).

7 AUDIO SECTION

7.1 Mixer and Frequency Synthesis

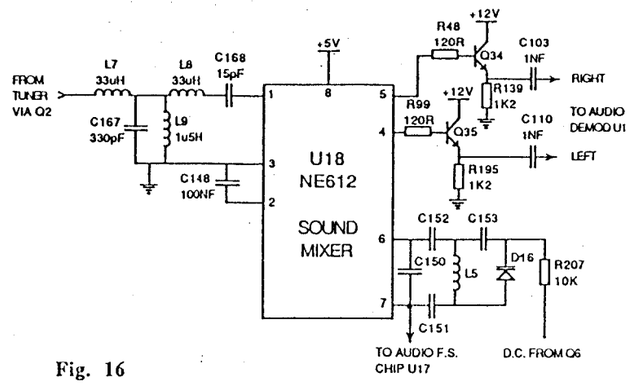


Fig. 16

The Baseband Video Signal from the tuner module on PLA is fed to the sound mixer IC U18 via a bandpass filter so that only audio sub-carriers are allowed through. The sound mixer has an internal oscillator the frequency of which is set by components around Pin 6 and 7.

The Audio F.S. chip U17 (not shown) works on the same principle as described in the Video Section, i.e. the Audio F.S. Chip is controlled by the M.C.U. and compares the oscillator frequency of the mixer with the required and generates error pulses. These error pulses are integrated by R205 and C145 (not shown) and the D.C. voltage is transferred to D16 (varicap diode) via Q1 and Q6. The D.C. voltage changes the diode capacitance, hence the oscillator frequency changes. The cycle continues until the oscillator frequency matches the chosen frequency. The resulting I.F. signals are then buffered by Q34 and Q35 to provide matching impedance for the next stage.

7.3 Audio Frequency Filter

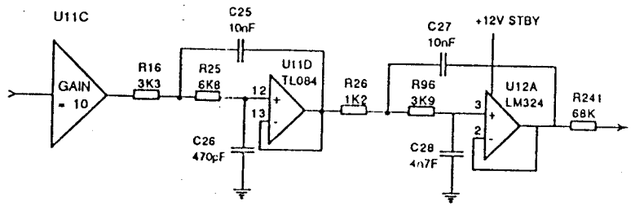


Fig. 18

NOTE:- ONLY right channel is described since both are identical.

The demodulated signal from U1 is amplified by U11C, which is configured as a non-inverting amplifier with a gain of 10.

The audio signal is then fed to two low pass filters connected in series, formed by U11D and U12A, with 3dB points set at 50KHz and 8KHz respectively. The combined response of the filter gives a cut off frequency of 15KHz with attenuation slope of approximately 24dB per octave.

The main mono channel is de-emphasised (50μs) by U15C (not shown) and associated circuitry and fed directly to the audio switch U2. All the stereo channels are fed to the PANDA noise reduction system circuitry.

7.2 Audio Demodulator

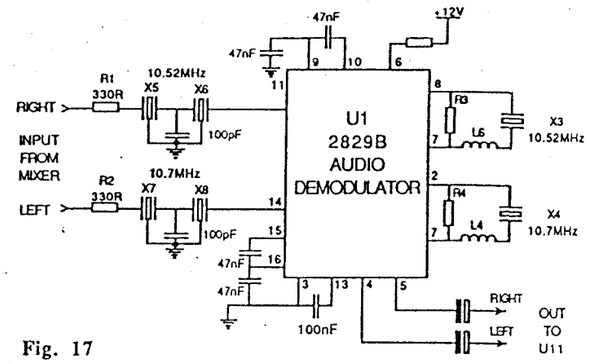


Fig. 17

The outputs from the mixer are fed into a dual channel audio demodulator chip, U1, via bandpass ceramic resonators centered on 10.52 MHz and 10.7 MHz for the left and right channels. This gives the 180KHz channel spacing required for the Panda Stereo system on the Astra Satellite.

The FM demodulator chip U1 uses the phase locked loop principle, the centre frequencies being set by X3, X4 and associated components. Basically, the two PLL's lock on to the incoming signals and output voltage proportional to the change in the input frequency. These outputs on pins 4 and 5 are the chosen audio channels.

7.4 PANDA Noise Reduction System

The PANDA noise reduction system is used by Astra for its narrowband FM subcarriers to give superior dynamic range and signal to noise performance. At the time of transmission the signal is compressed according to its level and frequency, therefore, for an F.M. system a smaller bandwidth is required, resulting in less noise being introduced. At the receiving end the signal must be expanded accordingly in order to reproduce the original signal. The expansion is achieved by using a dual compander chip NE572(U13) for left and right channels. U12 is used as a level convertor and has its input biased at mid rail to allow full swing on the output, and forms the input to U13.

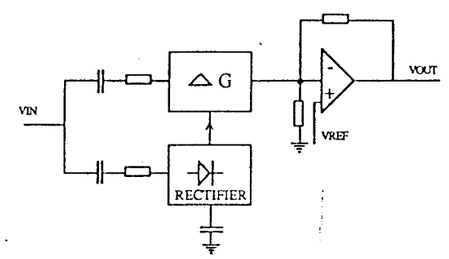


Fig. 19

The expander consists of a variable gain cell (Δ gain), rectifier and current to voltage convertor. The input signal is fed to a variable gain cell and rectifier. The output of the rectifier controls the gain so that the output is proportional to the average value of the input. All this is performed by U13. U14 converts the current output from the gain cell within U13 to a voltage, which is then passed through a low pass filter U14 to remove the high frequency content of the signal and then de-emphasised by U15. The output is then fed to the decoder scart and the audio switch.

The name PANDA and the trademark are the property of Wegener Communications U.S.A. Inc.

There are four audio sub-carriers to provide a choice of stereo or mono modes as shown below:-

MODE	LEFT FREQ. MHz	RIGHT FREQ. MHz	PANDA	U2 SWITCH POSITION
STEREO 1	7.02	7.20	YES	3
STEREO 2	7.38	7.56	YES	3
MONO 1	5.5 TO 8MHz	ADJUSTABLE	NO	1
MONO 2	7.02	---	YES	0
MONO 3	---	7.20	YES	2
MONO 4	7.38	---	YES	0
MONO 5	---	7.56	YES	2

Audio mute operates by taking the CHIP ENABLE (Pin 6) high, putting all the analogue switches in to a high impedance (OFF) state independent of A0 and A1.

R272 and R273 (not shown) are for preventing switch noise which may occur when switching into and out of MUTE. They maintain the D.C. voltage on the output isolation capacitors, C14, 15 and 16, when U2 is in the MUTE mode.

reverse biasing of components. When the 17.2V supply is switched off (M.C.U. Pin 4), the 12.6V supply takes over and holds the output at 12.6V. Short circuit protection is provided by R134, 135, D9, 28, 27 and 23. The circuit detects a short circuit by checking if the output voltage is less than approximately 4V (fixed by D28, 27 and 23) with approximately 25mA flowing (fixed by R129 and 242).

This presents no problem on switch-on, as the Marconi LNB is a non-linear load and requires a voltage in excess of 5V before any appreciable current flow.

NB:- The overcurrent protection on the unregulated side is provided by 3 Amp wire ended fuse (R146) for the 12V line and two polyswitches for 5V and 18V line.

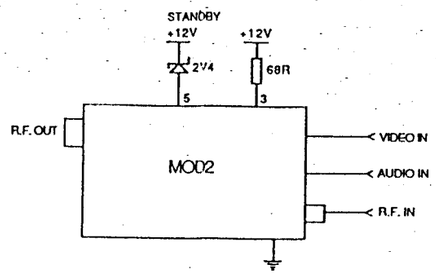
The polyswitch is a circuit protector with a positive temperature co-efficient (P.T.C.) resistor that undergoes a large abrupt increase in resistance when an overcurrent condition occurs.

After switching, the polyswitch will remain in its high resistance state by a small sustained self heating current. The device will only reset after the overload has been reduced below the holding current and the device been given sufficient time to cool down.

CAUTION:- The above devices are Safety Critical components and must be replaced by the correct type.

Please note that the 3 Amp fuse is easily blown if the unit is not disconnected from mains when removing or re-installing the P.C.B. This is due to short circuiting of the components caused by P.C.B. supports of the metal box.

8 U.H.F. MODULATOR



This is contained in the second module (MOD2) and acts as an aerial amplifier for the terrestrial U.H.F. signals. It also contains the U.H.F. modulator for the satellite audio and video signals and a tuning pattern generator.

This unit is very similar to those used on video recorders and is tunable over the range from Channel 30 to 39, it is supplied pre-tuned to Channel 38.

This module requires two power supply inputs. One to power the U.H.F. amplifier which is active on Standby (9V on Pin 5) and powers the U.H.F. loop-through facility, the other to supply the modulator (9V on Pin 3) which is switched off during stand-by. Both supplies are dropped from the 12V supply, using a zener diode D10 for the U.H.F. amplifier and a 68 ohm resistor for the modulator.

9 MICRO COMPUTER UNIT (M.C.U.)

The Satellite Receiver is controlled by a Z8611 micro computer U4, which performs the following functions:-

a) Detects and decodes the remote control codes
b) Generates the control signals for on-screen graphics
c) Controls the frequency synthesis for video and audio
d) Controls the routing of video and audio signals
e) Other switching functions such as operating relays, LED's etc.

The master clock is generated from a 5.625MHz Crystal and is used to time all processor functions.

All the variable data (e.g. tuning, contrast, polarity, AV modes etc.) is stored in an EEPROM (non-volatile memory U3). This is a 1K bit serial device which does not require any power supply to maintain data storage.

Stand-by relay RL1 is operated by Pin 29 of M.C.U. via Q26. Power supply to the processor Pin 1 is from 5V supply and is present during both the on and stand-by mode.

IR RECEIVER

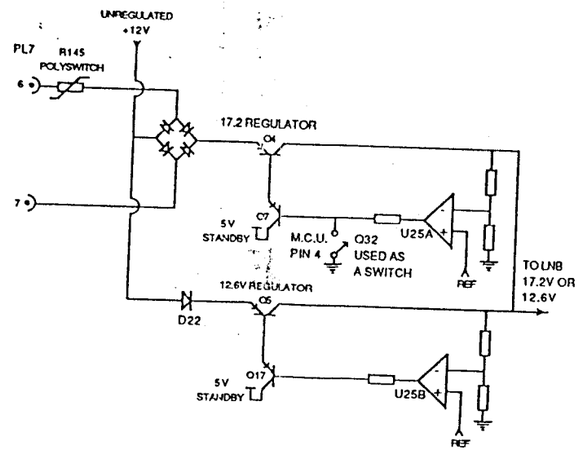
The Infra red signals from the remote control are received by LED5 (photo-diode) and fed to U6 (TBA2800), which amplifies and filters the signals before passing it to the M.C.U. U4 (pin 12).

Whenever the M.C.U. detects a valid code it flashes LED2.

Short circuit protection on the regulated side is provided by D24, since if the output goes short circuit D24 turns on switching off Q30 and Q28.

The Marconi LNB requires two different supply voltages to switch between horizontal (17.2V) and vertical (12.6V) polarity. The unregulated 12V and the 4.5V winding are combined to produce the regulated 17.2V for horizontal selection.

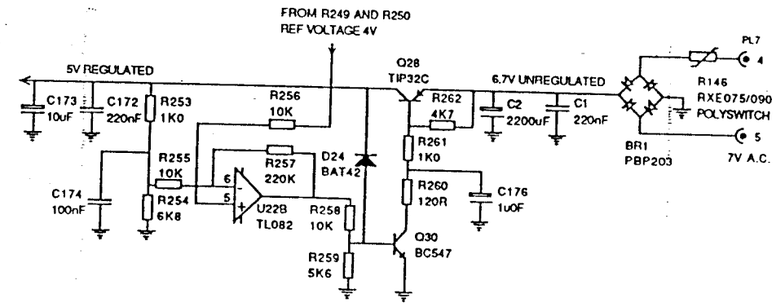
Simplified Diagram for LNB Supply



The LNB supply consists of two regulators of 12.6V and 17.2V with their outputs connected together. When both regulators are switched on, the 17.2V supply forces the output to 17.2V which causes the 12.6V supply to switch off.

This happens because the 12.6V supply thinks the output is too high and therefore switches off Q5. Diode D22 is used to prevent

10 POWER SUPPLY



The power supply consists of three main sections, consisting of the 5V supply, 12V supply and the LNB supply.

All the supply regulators work on the same principle, so only the 5V supply will be described. The design is a series regulator consisting of a Series pass transistor Q28, voltage reference provided by the potential divider formed by R249 and R250 and a differential amplifier U22B.

When first switched on Q28 is not conducting but since U22B has a reference voltage on its positive input, the output therefore goes high turning Q30 hard on which in return switches Q28 on.

As the load draws current the voltage at the negative input of U22B decreases increasing its output. This in turn increases the base and hence collector current of Q30. The additional current through R260 and R261 increases the collector current through Q28, corporating for the increase in load current.

For practical measurements, both inputs of the differential amplifier must be equal in order for regulation to take place.

11 · PRODUCTION CHANGES OF THE RECEIVER - 21/5/90. Issue 1

Mains Transformer
The first 6,000 units were fitted with two mains transformers connected in parallel, after this the units were fitted with a single transformer electrically identical to the parallel combination. The single transformer was later modified to incorporate an extra tap for 220V operation.

All units for U.K., Northern Ireland and Eire use have been of Class I type (ie. 3 core mains cable) but due to European compatibility all future units shall comply with Class 2 (i.e. 2 Core Mains Cable).

For safety reasons always replace with the correct mains cable.

P.C.B. Revisions
There are four revisions of production P.C.B.'s. These are listed below with their differences.

1. Revision A3
This is the first production board for the Stereo Satellite Receiver.

2. Revision A3a
This is electrically identical to A3, except that U3 Pin 6, is isolated on A3a revision, so that it no longer requires cutting at pre-insertion.

3. Revision A3b
The electrical difference between A3a and A3b is as follows:-

i) U10 (4538) Pin 12 is disconnected from ground and connected to U10 Pin 10. This configures U10 in a non re-triggerable mode, so that false triggering is avoided.

ii) Earth track around Infra-red can is separated so that the bottom cover of the Infra-red must be fitted for it to work. Previously, if the bottom cover was missed the Infra-red circuitry would still work but with reduced sensitivity.

4. Revision A5
The difference between A3b and A5 is as follows:-

i) The earth tracking around the M.C.U. has been changed. To facilitate this, a zero ohm surface mount resistor (R289) has been added and D3 is rotated by 180 degrees. This change is introduced to cure the M.C.U. occasionally entering lock mode on power up.

ii) Link 88 no longer exists on A5 because it has been replaced by tracking on the copper side of the P.C.B.

Shown below are modifications that have been introduced in order to improve the performance of the unit. Only applicable up to and including P.C.B. revision A3b.

On-Screen Graphics Bounce on Peak White Picture
Change R66 from 3K3 to 8K2
Change R70 from 68K to 47K
Change R90 from 33K to 15K
Change R108 from 1M to 470K
Change C79 from 100nF to 47nF for A3a

Tuner Change BSF563AZ
If the BSF561A tuner is replaced by BSF563AZ Tuner, then the following resistors must also be changed.

R36/R221 from 18R to 6R8
R37/R220 from 22R to 6R8

Lock Mode
The following modification cures units occasionally entering Lock Mode on power up. Delete Link 5 and add wire link between Link 5 position nearest to U4 and Pin 4 of unused U19.

TECHNICAL SPECIFICATION

Receiving Frequency	950-1750MHz
LNB Output Voltage	Horiz. 17.2v, Vert. 12.6v
Input Impedance	75 Ohms
I.F. Frequency	479.5MHz
I.F. Bandwidth	27MHz
Input Level	-63 to -25 dBm
Image Rejection	50dB (typically)
Input Connector	Type F Female
Threshold	6.5dB C/N (typically)
Video De-emphasis	CCIR 405-1
Video Output Level	1v p-p
Video Output Impedance	75 Ohms
Video Frequency	20Hz to 4.8MHz +/-3dB
Video Output Connector	SCART
Baseband Output Level	1v p-p into 75 Ohms load
Baseband Modes (MAC/PAL)	Flat or De-emphasised (Software Switched)
Baseband Frequency Response (MAC)	20Hz to 10.5MHz ± 3dB
Energy Dispersion Removal	Greater than 40dB
Audio Modes	Main Mono (Tunable) Stereo Pairs (Fixed) Individual channels (Fixed)
Main Mono Subcarrier	5.5 to 8.0MHz tunable
Stereo Subcarriers	7.02 & 7.20MHz PANDA 1 7.38 & 7.56MHz PANDA 1
Audio Frequency Response	50Hz to 16KHz +/-3dB
Audio Output Level	0dBm/600 Ohms
Audio I.F. Bandwidth	150KHz
Audio Output Connector	SCART and PHONO'S
U.H.F. Modulator	CCIR CH 30 to 39 with test signal, Preset to channel 38
Operating voltage	240v +/- 10% 50Hz
Power Consumption	30 Watts (typically)
Dimensions	H 56mm, W 360mm, D 200mm
Weight	3.4Kg

IR OPTION B

IR OPTION A

PL4 SHARP OPTION

DKI OPTION

NEC OPTION

INT/EXT AUDIO

PAL/MAC

VISION TUNING VOLTAGE

TUNING VOLTS SUPPLY (+20V)

+18V MODULE SUPPLY

EXT VIDEO I/

U6 TBA2800

U24 SL486 IR RECEIVE

U3 93C46 NON VOL MEM.

U4 Z86E11 MICRO

U19 OKI GRAPHICS CHIP

U9 NEC GRAPHICS CHIP

U21 UA733 VIDEO AMP

U20 LM7001 VIDEO FS

U18 NE612 SOUND MIXER V.C.O.

MOD1 BSF-563AZ TUNER

RL1 E3230 12V

X2 5.625MHz

X5 10.52MHZ

X6

LED5 BPW41N

LED3 LOCK

LED4 STEREO

LED2 IR RECEIVE

Q3 BC547

Q2 BC547

Q8 ZTX300

Q9 ZTX300

Q26 BC547

Q34 BC547

Q35 BC547

Q10 BC547

Q23 ZTX3

D13 1N4005

D1 1N4148

D15 1N4148

D3 BAT42

U58 7416

U5C 7416

U5A 7416

U5F

U5E

U50

U26A 7416

PL2

PL4

PL8

PLA

PL4.9

PL4.7

PL1.20

U10.7

U23.4

U23.2

U10.9

U16.9

R104 560R

R105 560R

R133 560R

R18 10K

R212 3K9

R213 10K

R64 10K

R47 10K

R60 10K

R61 10K

R95 10K

R155 10K

R140

Q35

R112 4K7

R113 4K7

R100 12K

R230 10K

R83 1K0

R102 5K6

R103 1K8

R275 1K2

R39 2K7

R218 1K0

R139 1K2

R89 120R

R1 330R

R35 1K0

R221 6K8

R220 6K8

R36 6K8

R37 6K8

R15 470R 2%

R20 750R 2%

R23 0R0

R22 390R

R21 1K0 2%

R42 390PF +/- 5%

R24 2K2

R27 10K

R28 10K

R29 2K2

R264 18R

R31 3K3

R32 8K2

R33 2K2

A5 2K2

A9 2K2

A7 1K0

C179 1N0F

C87 22UF

C90 1U0F

C180 10NF

C159 4N7F

C158 15NF

C160 100PF

C155 150NF

C89 4N7F

C88 33NF

C4 100UF

C3 10UF

C157 22UF

C95 10UF

C33 100NF

C107 330PF

C17 10NF

C30 220UF

C91 100NF

C34 22PF

C35 22PF

C36 1U0F

C104 1N0F

C105 1N0F

C106 1N0F

C72 33PF

C73 33PF

C141 33PF

C66 100NF

C65 10UF 25V

C68 10UF

C67 100NF

C29 10UF 25V

C165 1U0F 25V

C13 220NF

C32 1N0F

C40 1N0F

C31 100NF

C64 10UF

C70 100NF

C47 15PF

C147 100NF

C168 15PF

C148 100NF

C167 330PF

C150 56PF

C146

C151

C152 1N0

C156 100NF

C62 100UF

C63 100NF

C163 100NF

C46 10UF

C44 1UF

C45 10UF

C48 15PF

C103 1N0F

C6 47NF

C19 47NF

L3 33UH

L7 33UH

L8 33UH

L9 1U0H

+5V STBY

+12V STBY

+5V

+12V

+18V

PL1.16

PL1.6

SYNC OPTION A

SYNC OPTION B

CONTRAST LEVELS

DECODER

LO' PASS FILTER

ENERGY DISP. CLAMP

CLOCK OPTION

IATE BUB ASSEMBLY

PL6 OPTIONAL IATE ONLY

BASE BAND O/P

VIDEO O/P

VT SYNC

HZ SYNC

PAL/MAC

PHONO

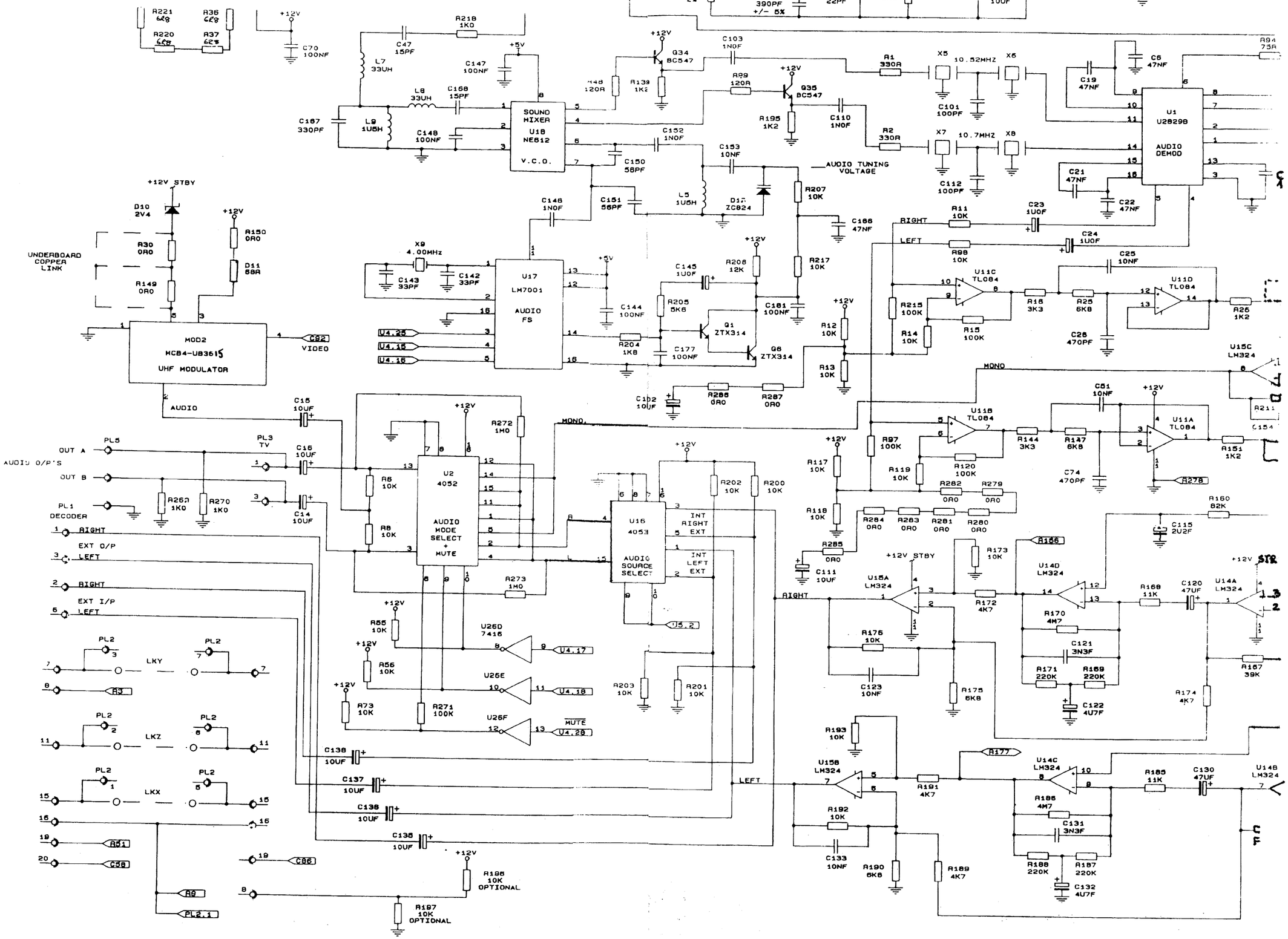
LED1 STANDBY

+12V STBY

BR2 PBL401

R148 ENCAP FUSE 3A

+12V
R3 330R
L5 12UH
X3 10.82MHZ
L4 12UH
R4 330R
X4 10.7MHZ
20
00NF
LED1 STANDBY
R17
RL1A
+12V STBY
+12V
C170 10UF
C171 100NF
R213 4K3
R222 5K6
R224 10K
PL2
PLY
+5V STBY
RL1B
+5V
C173 10UF
C172 220NF
R253 1K0
R256 10K
R254 5K6
C174 100NF
R257 220K
U22B TL082
R258 10K
R259 5K6
D24 BAT42
Q30 BC547
R281 1K0
R280 120R
C176 1U0F
R282 4K7
Q28 TIP32C
C2 2200UF
C1 220NF
SR1 PSP203
R148 RXE075 POLYSWITCH
PL7
R146 ENCAP FUSE 3A
SR2 PSL401
R164 4K7
R216 5K6
C161 100NF
Q31 BC557
Q18 BC547
D2 1N4148
C18 220NF
R10 33K
Q27 TIP32C
R263 4K7
D20 1N4148
R226 560R
D21 BAT42
R247 470R
R227 10K
U22A TL082
R248 120R
C175 1U0F 25V OPTIONAL
R246 10K
R276 5K6
Q29 BC547
R249 1K0
R250 4K7
D19 8V1 2%
D18 9V1
R252 1K0
C11 3300UF 25V
C10 220NF
R156 39K
U14.14
C27 10NF
+12V STBY
U12A LM324
R241 68K
C38 470NF
R157 10K
U12D LM324
R96 3K9
C28 N7F
R209 4K7
R210 4K7
C182 10NF
R208 10K
C98 4U7F
R155 10K
+12V STBY
R154 10K
10K
10NF
C78 10NF
U12B LM324
C96 470NF
U12C LM324
R153 68K
U14.8
R177 39K
R178 10K
+12V STBY
R162 10M
R239 4M7
C116 100NF
C117 3U3F
R166 1K0
U13A NE572
C99 47UF
R161 2K0
C114 2U2F
C119 4U7F
C118 100NF
R163 27K
RIGHT "PANDA" CIRCUIT
R179 82K
C124 2U2F
C127 100NF
R183 1K0
U13B NE572
R180 2K0
C125 2U2F
C126 47UF
C129 4U7F
R184 19K
R182 27K
C128 3U3F
R240 10M
R181 4M7
+12V STBY
LEFT "PANDA" CIRCUIT
+12V STBY
R238 560R
R138 1K2
C93 100NF
C100 10UF
D14 6V1 2%
C9 10NF
SUPPLY (20V)
R245 330R
TUNING VOLTS
C108 10UF 25V
D26 20V
D25 1N4005
C6 100UF 25V
R288 820R
SR3 W005
R145 RXE075 POLYSWITCH
+18V MODULE SUPPLY
Q4 TIP32C
C113 100NF
C69 10UF 25V
R142 8K2 1%
R143 10K 1% OPTIONAL
R141 10K
R137 10K
U25A TL082
R132 4K7
R131 4K7
R136 100K
C149 100NF
R143 3K3 1%
LK1
PL8.1
U4.4
R140 10K
Q32 BC547
R134 470R
D9 1N4148
R135 560R
R128 1K0
R127 4K7
C7 220NF
C8 2200UF
Q7 BC547 +5V STBY
R129 270R
R242 330R
Q5 TIP32C
D22 1N4005
C109 100NF
C75 10UF 25V
D28 1N4148
D27 1N4148
D23 1N4148
R234 4K7 1%
R237 10K
R235 10K
U25B TL082
R232 4K7
R231 4K7
R226 4K7
R229 1K0
Q17 BC547 +5V STBY
C152 100NF
R244 17K 1%
R236 3K3 1%
R233 100K


R221 68
R220 68
R36 68
R37 68
+12V
C70 100NF
R218 1K0
C47 15PF
L7 33UH
+5V
C147 100NF
L8 33UH
C168 15PF
C167 330PF
L9 1U8H
C148 100NF
SOUND MIXER
U18 NE612
V.C.O.
C152 1NOF
C150 56PF
C153 10NF
C151 56PF
L5 1U5H
D12 ZC824
C146 1NOF
X9 4.00MHz
C143 33PF
C142 33PF
U17 LM7001
AUDIO FS
U4.25
U4.15
U4.16
C144 100NF
R204 1K8
R205 5K6
C145 1U0F
R208 12K
Q1 ZTX314
Q6 ZTX314
C177 100NF
C161 100NF
R207 10K
R217 10K
C166 47NF
+12V STBY
D10 2V4
R30 0R0
R149 0R0
R150 0R0
D11 68R
UNDERBOARD COPPER LINK
MOD2
MC84-UB361S
UHF MODULATOR
C82
VIDEO
AUDIO
C15 10UF
C16 10UF
C14 10UF
PL5
OUT A
OUT B
AUDIO O/P'S
PL3 TV
PL1 DECODER
R260 1K0
R270 1K0
1 RIGHT
EXT O/P
3 LEFT
2 RIGHT
EXT I/P
6 LEFT
PL2
LKY
LKZ
LKX
A5
A51
C58
A9
PL2.1
C86
R272 1M0
U2 4052
AUDIO MODE SELECT + MUTE
R6 10K
R8 10K
R273 1M0
R55 10K
R56 10K
R73 10K
R271 100K
U26D 7416
U26E
U26F
U4.17
U4.18
MUTE
U4.20
C138 10UF
C137 10UF
C136 10UF
C135 10UF
R186 10K OPTIONAL
R187 10K OPTIONAL
MONO
U16 4053
AUDIO SOURCE SELECT
INT RIGHT EXT
INT LEFT EXT
U5.2
R202 10K
R200 10K
R203 10K
R201 10K
C103 1N0F
Q34 BC547
R148 120R
R138 1K2
R89 120R
Q35 BC547
R195 1K2
C110 1N0F
C152 1N0F
AUDIO TUNING VOLTAGE
R1 330R
R2 330R
X5 10.52MHZ
X6
X7 10.7MHZ
X8
C101 100PF
C112 100PF
R94 75R
C6 47NF
C19 47NF
C21 47NF
C22 47NF
U1 U2829B AUDIO DEMOD
C5
C4
RIGHT
LEFT
R11 10K
R98 10K
C23 1U0F
C24 1U0F
C25 10NF
U11C TL084
U11D TL084
R215 100K
R14 10K
R15 100K
R16 3K3
R25 6K8
C26 470PF
R26 1K2
R12 10K
R13 10K
C162 10UF
R286 0R0
R287 0R0
U15C LM324
MONO
C51 10NF
U11B TL084
U11A TL084
R144 3K3
R147 6K8
R151 1K2
R211
R278
C74 470PF
R97 100K
R119 10K
R120 100K
R282 0R0
R279 0R0
R117 10K
R118 10K
R284 0R0
R283 0R0
R281 0R0
R280 0R0
R285 0R0
C111 10UF
R160 82K
C115 2U2F
R166
R173 10K
U15A LM324
U14D LM324
R172 4K7
R176 10K
C123 10NF
R175 6K8
R170 4M7
C121 3N3F
R171 220K
R169 220K
C122 4U7F
R168 11K
C120 47UF
U14A LM324
R167 39K
R174 4K7
+12V STB
RIGHT
R193 10K
U15B LM324
R192 10K
C133 10NF
R190 6K8
R191 4K7
R189 4K7
R177
U14C LM324
R185 11K
C130 47UF
U14B LM324
R186 4M7
C131 3N3F
R188 220K
R187 220K
C132 4U7F
LEFT

SYNC OPTION A

SYNC OPTION B

CLOCK OPTION

ENERGY DISP. CLAMP

DECODER

CONTRAST LEVELS

GRAPHICS VIDEO MIXER

LO PASS FILTER

IRTE SUB ASSEMBLY

VIDEO O/P

BASE BAND O/P

PHONO

PAL/MAC

VT SYNC

HZ SYNC

LED1 STANDBY

ENCAP FUSE 3A

OPTIONAL IRATE ONLY

R221 6K8
R220 6K8
R36 6K8
R37 6K8
+12V
C70 100NF
R218 1K0
C47 15PF
L7 33UH
L8 33UH
C168 15PF
C167 330PF
L9 1U5H
C148 100NF
SOUND MIXER U18 NE612 V.C.O.
C147 100NF
+5V
R48 120R
R138 1K2
Q34 BC547
C103 1N0F
R89 120R
Q35 BC547
R195 1K2
C110 1N0F
R1 330R
R2 330R
X5 10.52MHZ
X6
C101 100PF
X7 10.7MHZ
X8
C112 100PF
C152 1N0F
C150 56PF
C153 10NF
AUDIO TUNING VOLTAGE
L5 1U5H
D12 ZC824
R207 10K
C151 56PF
C146 1N0F
C166 47NF
R94 75R
C6 47NF
C19 47NF
U1 U2829B AUDIO DEMOD
C21 47NF
C22 47NF
C23 1U0F
C24 1U0F
R11 10K
R99 10K
RIGHT
LEFT
C25 10NF
U11C TL084
U11D TL084
R215 100K
R14 10K
R15 100K
R16 3K3
R25 6K8
R26 1K2
C26 470PF
+12V STBY
D10 2V4
R30 0R0
R149 0R0
UNDERBOARD COPPER LINK
+12V
R150 0R0
D11 68A
MOD2 MC84-UB361S UHF MODULATOR
C52 VIDEO
AUDIO
C15 10UF
X9 4.00MHz
C143 33PF
C142 33PF
U17 LM7001 AUDIO FS
U4.25
U4.15
U4.16
C144 100NF
R204 1K8
C145 1U0F
R205 5K6
Q1 ZTX314
Q6 ZTX314
R208 12K
C181 100NF
C177 100NF
R217 10K
R12 10K
R13 10K
C102 10UF
R288 0R0
R287 0R0
U15C LM324
MONO
R211
C154
C51 10NF
U11B TL084
U11A TL084
R144 3K3
R147 6K8
R151 1K2
R278
C74 470PF
R97 100K
R120 100K
R119 10K
R282 0R0
R279 0R0
R117 10K
R118 10K
R284 0R0
R283 0R0
R281 0R0
R280 0R0
R285 0R0
C111 10UF
R160 82K
C115 2U2F
R166
R173 10K
U15A LM324
U14D LM324
R172 4K7
R176 10K
C123 10NF
R175 6K8
R170 4M7
C121 3N3F
R171 220K
R169 220K
C122 4U7F
R168 11K
C120 47UF
U14A LM324
R167 39K
R174 4K7
PL5
OUT A
OUT B
AUDIO O/P'S
PL1 DECODER
PL3 TV
C16 10UF
C14 10UF
R267 1K0
R270 1K0
1 RIGHT
3 EXT O/P LEFT
2 RIGHT
6 EXT I/P LEFT
PL2
LKY
LKZ
LKX
R9
PL2.1
C66
R51
C58
R272 1M0
U2 4052 AUDIO MODE SELECT + MUTE
R6 10K
R8 10K
R273 1M0
U16 4053 AUDIO SOURCE SELECT
R202 10K
R200 10K
INT RIGHT EXT
INT LEFT EXT
U5.2
R55 10K
R56 10K
R73 10K
R271 100K
U26D 7416
U26E
U26F
U4.17
U4.18
MUTE U4.28
R203 10K
R201 10K
C138 10UF
C137 10UF
C136 10UF
C135 10UF
R186 10K OPTIONAL
R187 10K OPTIONAL
MONO
LEFT
R193 10K
U15B LM324
R192 10K
C133 10NF
R190 6K8
R191 4K7
R177
U14C LM324
R189 4K7
R186 4M7
C131 3N3F
R188 220K
R187 220K
C132 4U7F
R185 11K
C130 47UF
U14B LM324

IR OPTION B

IR OPTION A

PL4
SHARP OPTION

INT/EXT
AUDIO

PAL/MAC

OKI OPTION

NEC OPTION

VIDEO AMP

TUNING VOLTS SUPPLY (+20V)

VISION TUNING VOLTAGE

+18V MODULE SUPPLY

EXT VIDEO I/

U4 Z86E11 MICRO

U19 OKI GRAPHICS CHIP

U9 NEC GRAPHICS CHIP

U6 TBA2800

U24 SL486 IR RECEIVE

U3 93C46 NON VOL MEM.

MOD1 B3F-8634Z TUNER

U20 LM7001 VIDEO FS

U18 NE612 SOUND MIXER V.C.O.

U21 UA733

X2 5.625MHz

X5 10.52MHZ

X6

D13 1N4005

RL1 E3230 12V

D15 1N4148

D1 1N4148

D3 BAT42

LED2 IR RECEIVE

LED3 LOCK

LED4 STEREO

LED5 BPW41N

LED6 BPW41N

Q3 BC547

Q9 ZTX300

Q8 ZTX300

Q2 BC547

Q26 BC547

Q34 BC547

Q35 BC547

Q10 BC547

Q23 ZTX3

U5A 7416

U5B 7416

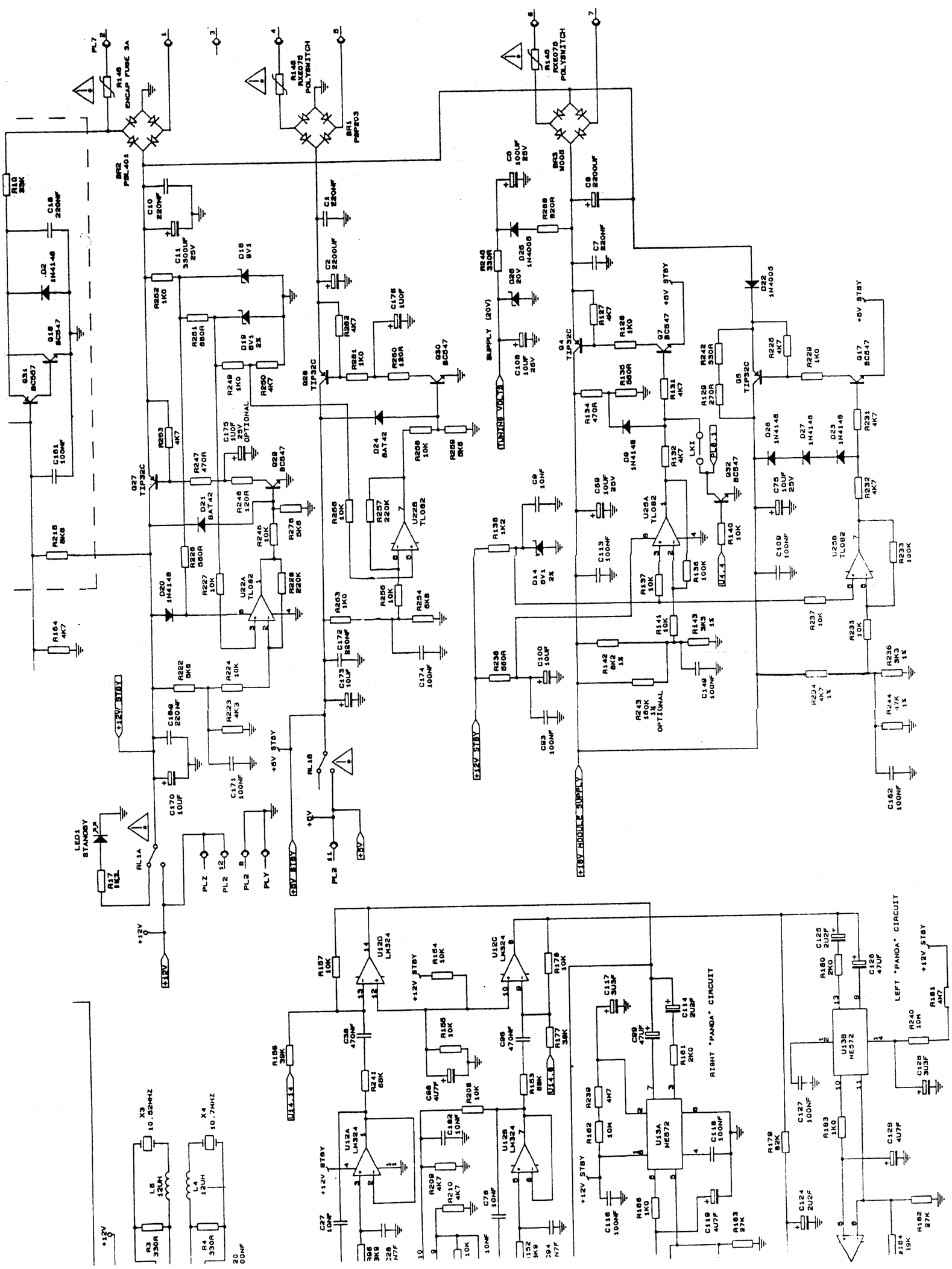
U5C 7416

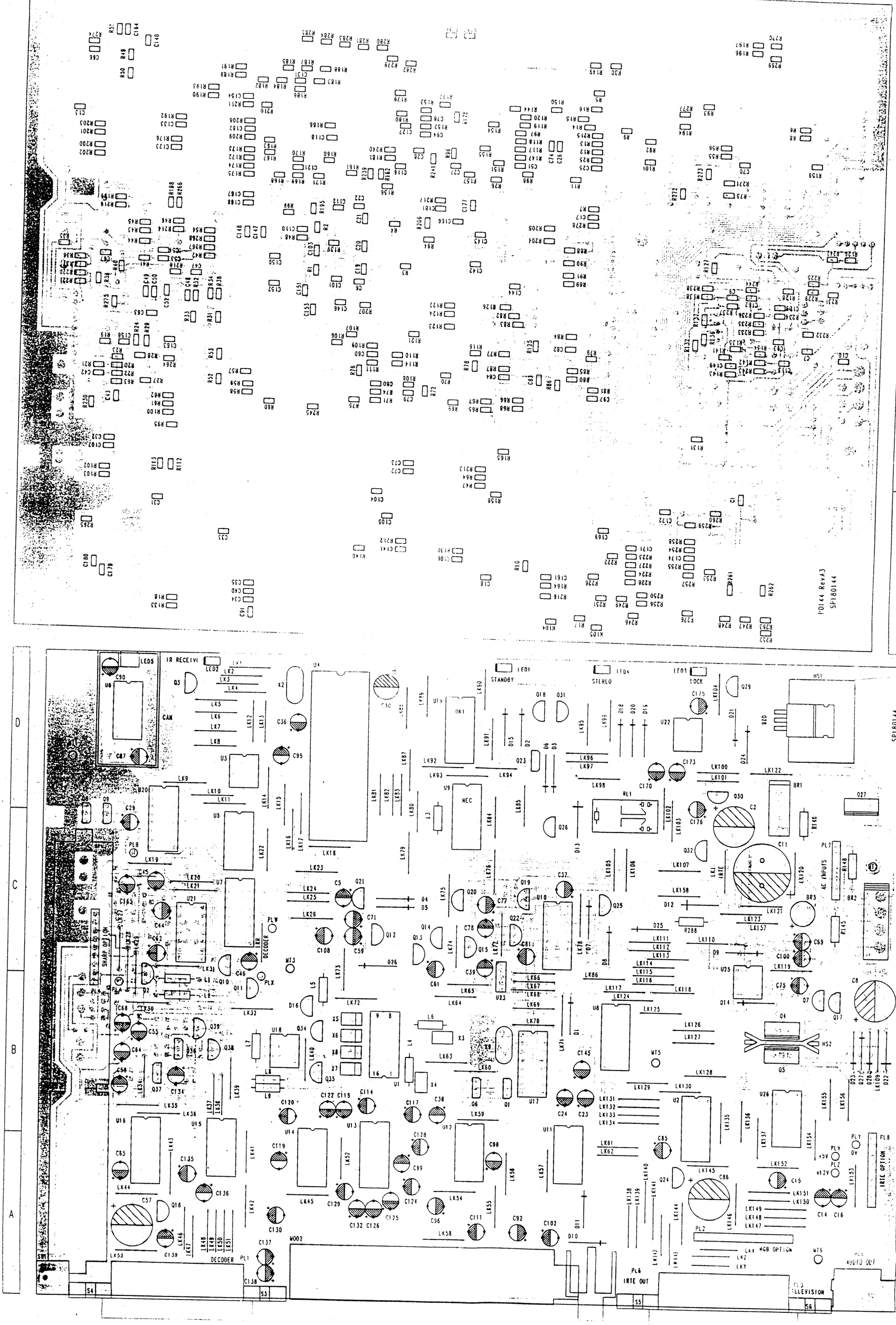
U5D 7416

U5E

U5F

U26A 7416


+12V STBY
+5V STBY
+18V MODULE SUPPLY
LEFT "PANDA" CIRCUIT
RIGHT "PANDA" CIRCUIT
SUPPLY (20V)
MINIMUM VOLTS
LED1 STANDBY
X3 10.52MHZ
X4 10.7MHZ
BR1 PBP603
BR2 PBL401
BR3 W005
R148 ENCAP FUSE 3A
R145 RXE075 POLYSWITCH
R146 RXE075 POLYSWITCH
PL7
PL2
PL1
RL1A
RL1B
U22A TL082
U22B TL082
U25A TL082
U25B TL082
U12A LM324
U12B LM324
U12C LM324
U13A NE572
U13B NE572
Q1 TIP32C
Q2 TIP32C
Q4 TIP32C
Q5 TIP32C
Q7 BC547
Q8 BC547
Q9 BC547
Q17 BC547
Q18 BC547
Q27 TIP32C
Q28 TIP32C
Q29 BC547
Q30 BC547
Q31 BC557
Q32 BC547
D2 1N4148
D9 1N4148
D14 6V1 2%
D18 6V1
D19 6V1 2%
D20 1N4148
D21 BAT42
D22 1N4005
D23 1N4148
D24 BAT42
D25 1N4005
D26 20V
D27 1N4148
D28 1N4148
LK1
LK2
LK3
LK4


LEDS
IR RECEIVE
LED2
LED1
STANDBY
LED4
STEREO
LED1
LOCK
CAN
DECODER
SHARP OPTION
IRTE OPTION
AC INPUTS
RGB OPTION
AUDIO OUT
TELEVISION
IRTE OUT
DECODER
PL1
PL2
PL3
PL4
PL5
PL6
PL7
PL8
PLW
PLX
PLY
PLZ
+5V
+12V
0V
MT3
MT5
MT6
SW1
W002
NEC
SP180144 RevA3
SP180144

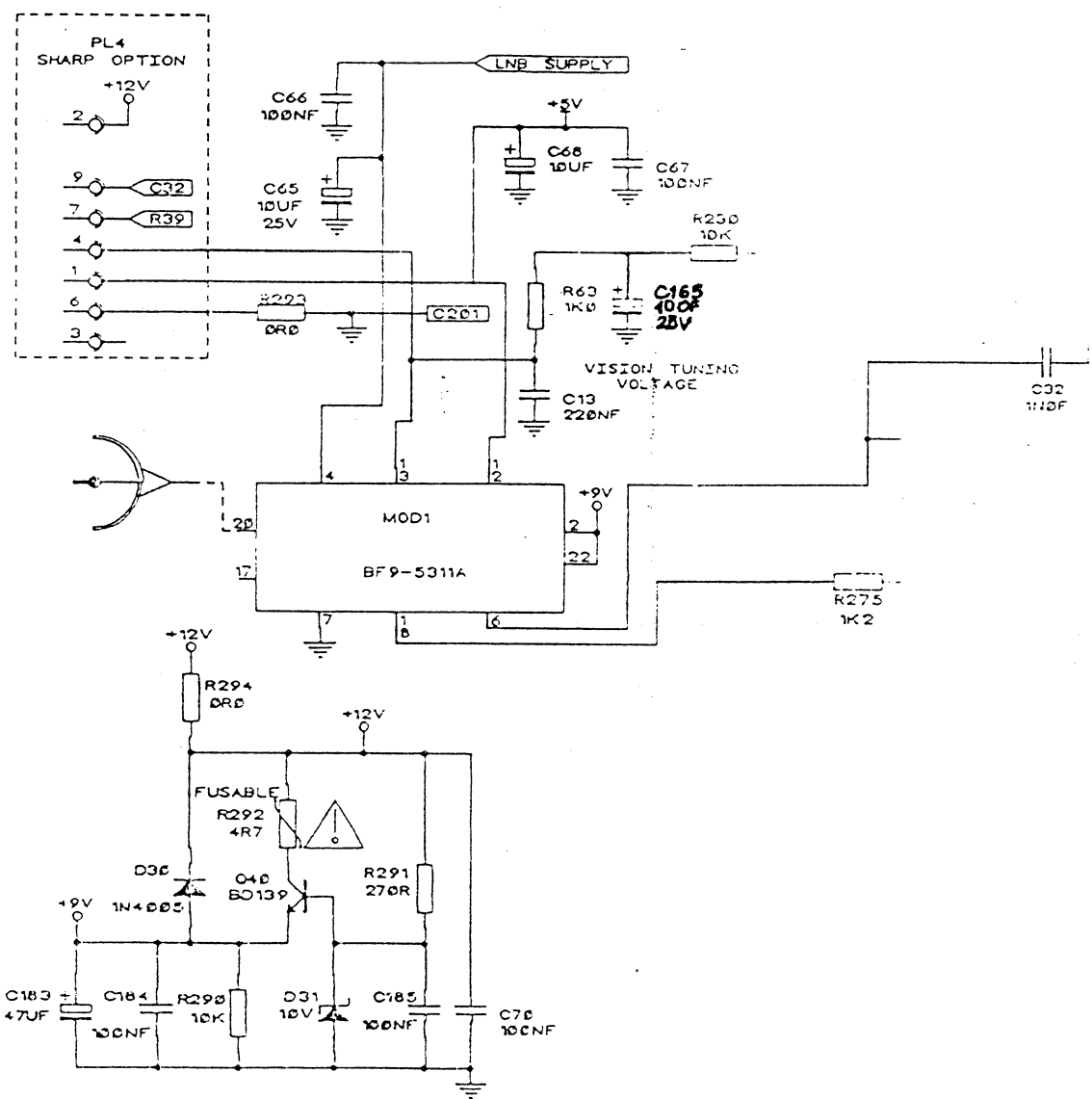
ADDENDUM FOR SS6060 USERS

The SS6060 is a 60 channel version of the SS6000.

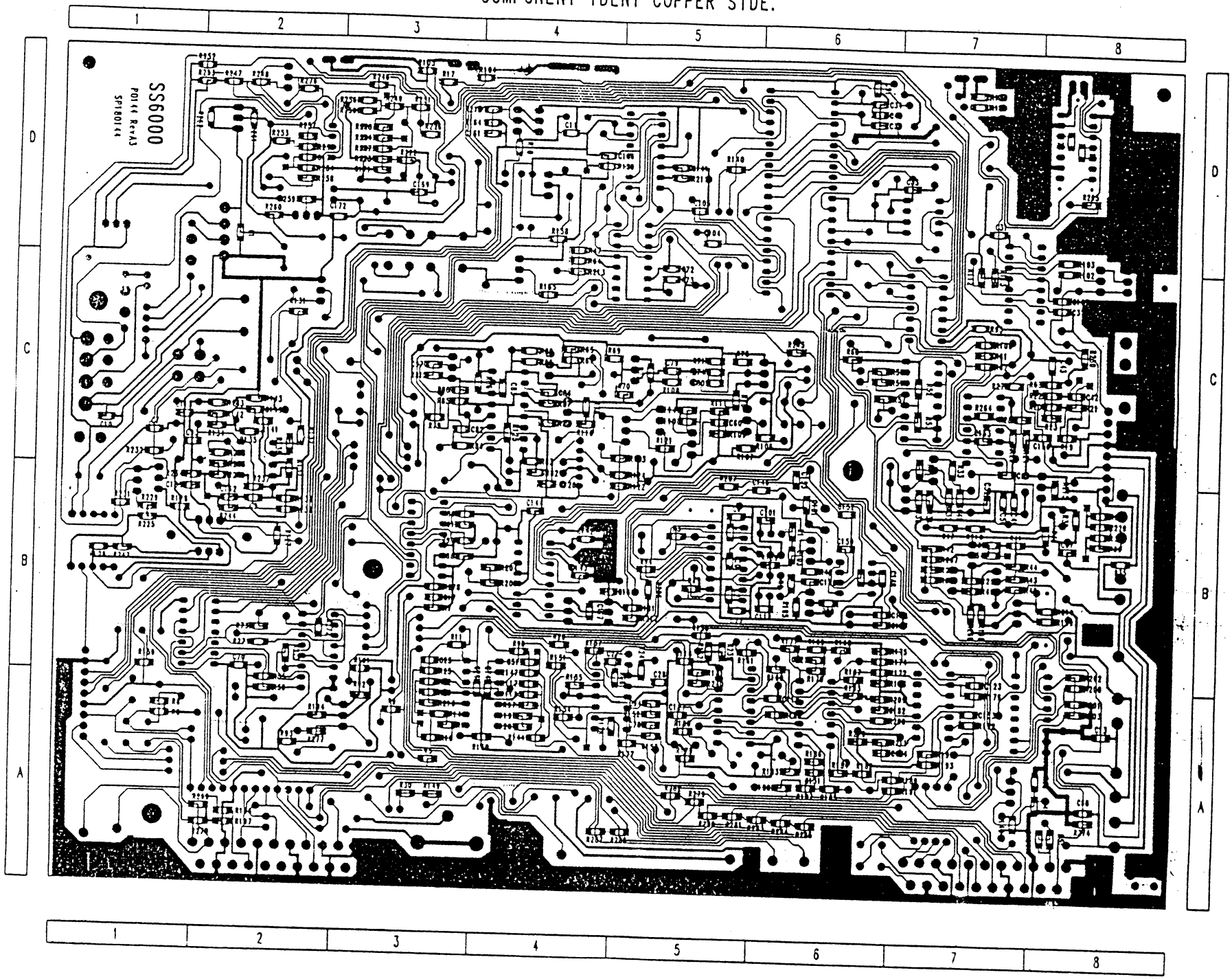
To obtain the additional channels the EEPROM has been increased from 1kbyte to 2kbytes.

Also the tuner and demodulator unit have been replaced with a combined tuner unit. This required the addition of a 9v supply which has been derived from the existing 12v rail.

Circuit operation is identical to the SS6000 except that the pin connections to the combined tuner are as shown in the following diagram.



COMPONENT IDENT COPPER SIDE.



COMPONENT IDENT COPPER SIDE.